WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced

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312/01

BIOLOGY (MODULAR)

MODULE BI2

A.M. MONDAY, 2 June 2003

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	

Centre Number .....

Candidate's Name (in full) .....

Candidate's Examination Number .....

INSTRUCTIONS TO CANDIDATES

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. *(a)* What happens to the surface area:volume ratio as animals increase in size? [1]

.....

(b) What is the role of intercostal muscles in the thorax of a mammal? [1]

.....

(c) Name the blood vessels that allow an interchange of oxygen and carbon dioxide between blood and tissues. [1]

.....

(d) Define the term *death rate*. [1]

.....

(e) Draw a simple diagram to show a typical pyramid of energy.
Label your diagram. [2]

(Total 9 marks)

(f) Give **one** cause of algal blooms. [1]

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(g) Distinguish between the terms *omnivore* and *carnivore*. [2]

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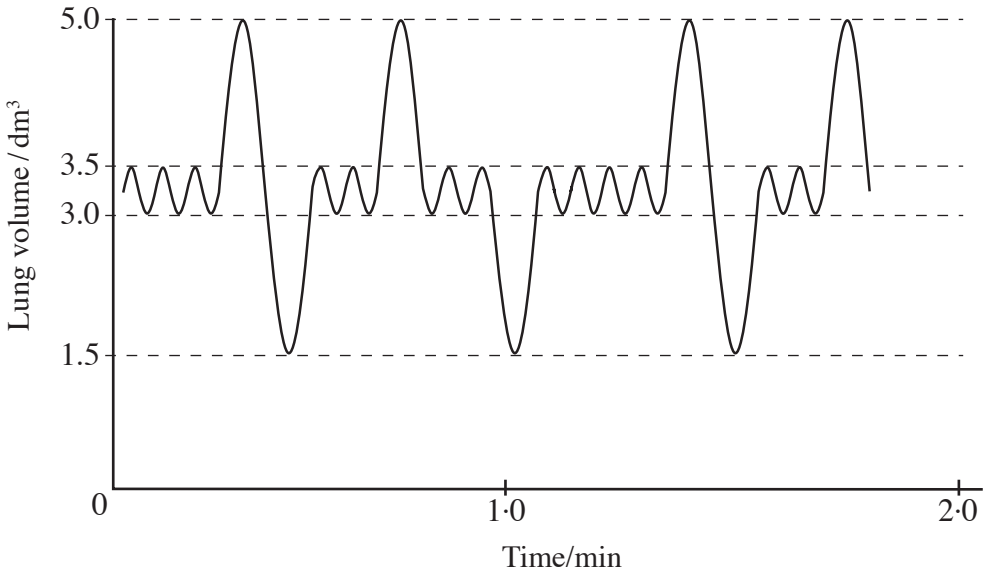
2. *(a)* The graph shows the result of a human, at rest, breathing in and out of a spirometer filled with pure oxygen.



(i) State the meaning of the term *tidal volume*. [1]

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.....

(ii) Indicate clearly on the graph, this person's vital capacity. [1]

(iii) From the graph, calculate the vital capacity for this person. **Show your working**. [2]

(iv) It is normal to pass exhaled air through a soda lime filter. What is the purpose of this filter? [1]

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(v) Suggest why it is important for the reliability of results, that the spirometer remains at a constant temperature. [1]

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.....

(b) By what process does the oxygen pass from the alveoli into the plasma? [1]

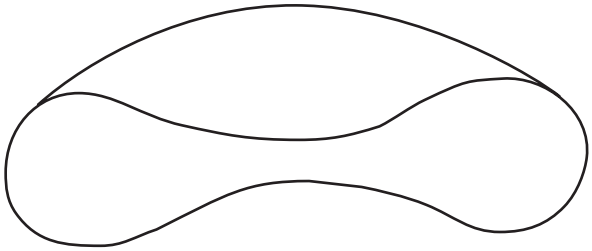
.....

(c) Complete every box in the table to show **one** effect, if any, of both asthma and emphysema on the bronchioles, alveoli and rate of intake of oxygen. Briefly describe the effect or write 'no effect' as appropriate. [6]

	Bronchioles	*Alveoli*	*Rate of oxygen intake*
Asthma			
Emphysema			

(Total 13 marks)

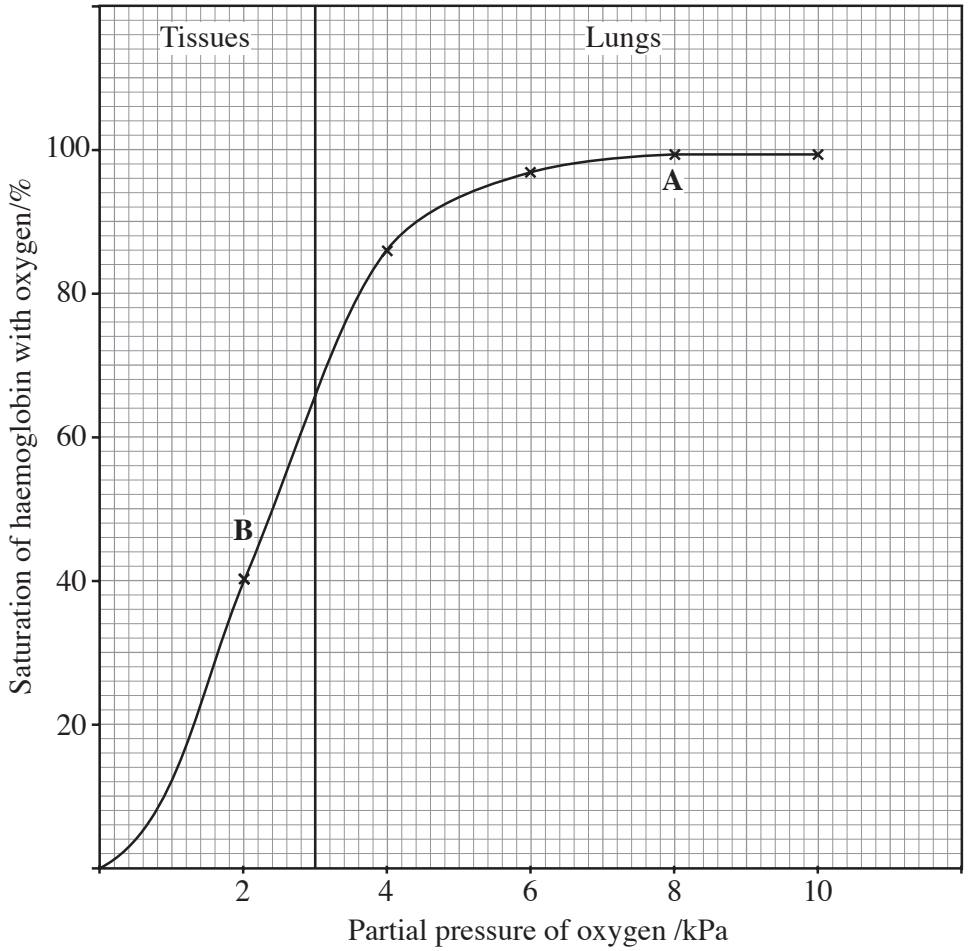
3. The diagram shows a section through a red blood cell.



(a) Complete the table to describe and explain **two** different adaptations that allow the red blood cell to carry out its functions. [4]

Description of adaptation	*Explanation of function*
.....	.....
.....	.....
.....	.....
.....	.....

(b) The graph shows the oxyhaemoglobin dissociation curve for adult haemoglobin.



(i) The normal lung partial pressure of oxygen is 10 kPa and at this partial pressure the haemoglobin is 99% saturated with oxygen. What would be the effect of reducing the partial pressure of the oxygen in the lung to 8 kPa? [1]

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(ii) Use your answer to part (i) to explain why the flat top to the curve (labelled **A**) would be advantageous to an organism. [1]

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.....

(iii) The blood, oxygenated in the lungs, passes to the tissues. What would be the most likely cause of a reduction of partial pressure O_2 in the tissues? [1]

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(iv) The part of the curve labelled **B** is much steeper. Explain how this would be advantageous to an organism. [2]

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(c) Llama haemoglobin has a higher affinity for oxygen when compared to human haemoglobin.

(i) Draw a dissociation curve for Llama haemoglobin on the graph, label it '**L**'. [1]

(ii) Why is it necessary for Llama haemoglobin to have a higher oxygen affinity? [1]

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(d) Explain what is meant by the chloride shift in the carriage of CO_2. [2]

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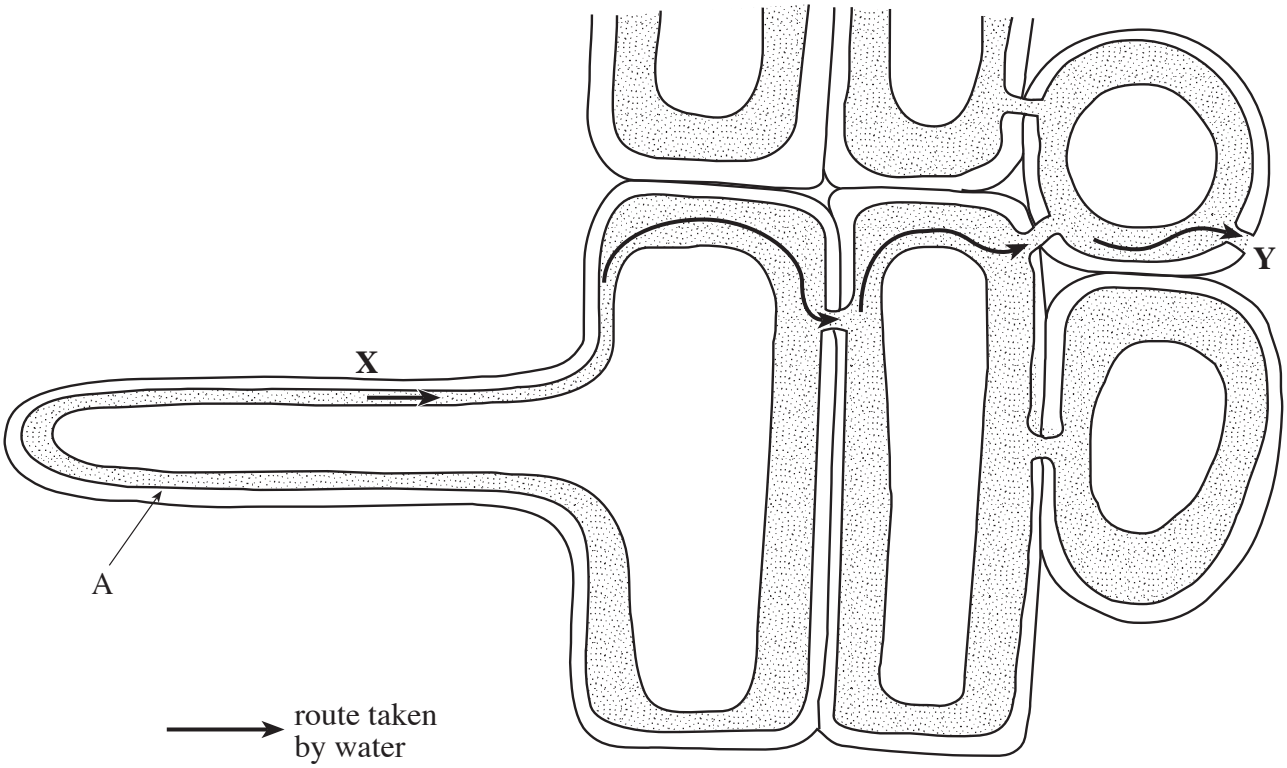
(Total 13 marks)

4. The diagram shows some cells in the root of a plant.



(a) (i) Name cell **A**. [1]

.....

(ii) How could nitrate ions enter the root if the concentration of nitrate ions outside the plant is less than the concentration inside cell **A**? [1]

.....

(iii) Water moves from point **X** to point **Y**. What name is used to describe the pathway? [1]

.....

(iv) Suggest how the Casparian strip in the endodermis may ensure the selective absorption of ions into the xylem of the root. [2]

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(b) The table shows the relative rate of transpiration in two grasses of equal leaf surface area.

Type of grass	*Relative transpiration rate*
Meadow grass species	100
Marram grass species	42

State **two** adaptations of the Marram grass leaf to account for the difference in transpiration rate. [2]

(i) .....

.....

(ii) .....

.....

(c) Transpiration may increase when stomata open. Describe the mechanism which causes stomata to open. [3]

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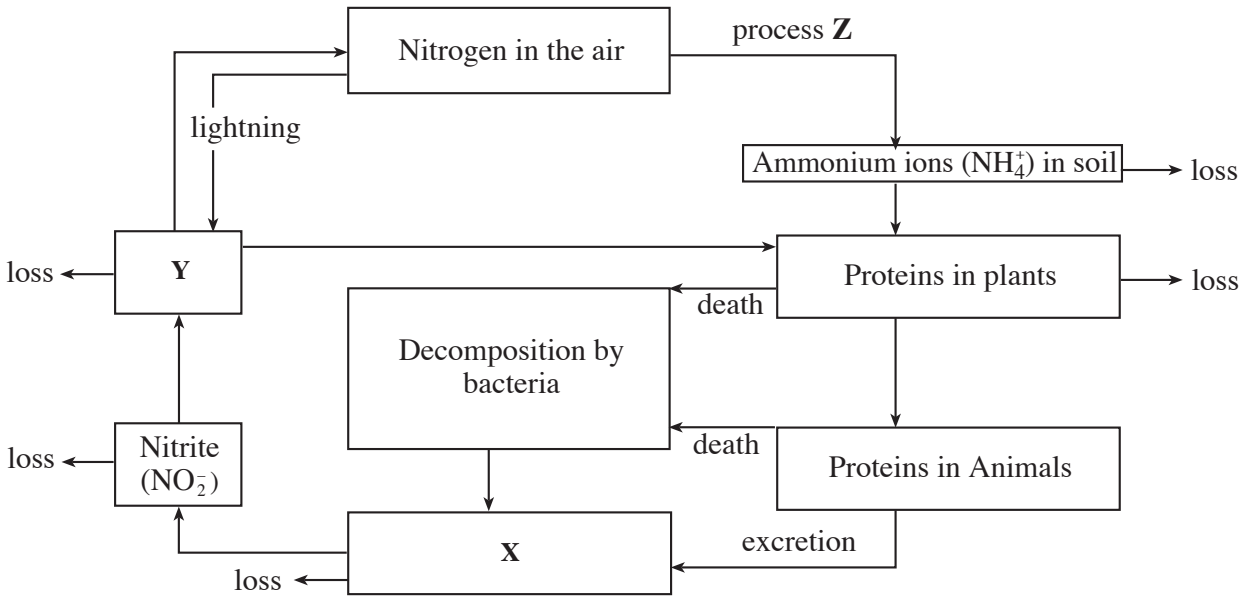
(Total 10 marks)

5. The diagram shows the Nitrogen Cycle.



(a) Name chemicals **X** and **Y**. [2]

X .....

Y .....

(b) Explain what happens in process **Z**. [2]

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.....

.....

(c) Suggest **one** way in which total nitrogen can be lost from an area of land. [1]

.....

(d) Suggest **two** different, direct consequences of an absence of decomposers in a forest-floor environment. [2]

(i) .....

.....

(ii) .....

.....

(e) Describe **one** advantage of ploughing agricultural land for the process of nitrification. [1]

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(Total 8 marks)

6. Volcanic eruptions under the surface of the sea sometimes produce new islands such as Surtsey which formed 40km off the coast of Iceland.
Krakatoa is an island 25km from the tropical island of Java in Asia. In 1850 Krakatoa suffered a violent volcanic eruption in which all life on the island was destroyed.
The table shows the number of flowering plant species that colonised the islands in the 12 years after the eruptions.

	Number of flowering plant species	
Number of years after eruption	*Surtsey*	*Krakatoa*
3	2	14
6	7	31
9	15	41
12	26	48

(a) What is meant by the term *succession*? [1]

.....

.....

(b) Suggest **two** reasons for the faster rate of colonisation on Krakatoa. [2]

1. .....

2. .....

(c) The pioneer plants became established on the bare rock of the islands after the eruptions. They helped to make the conditions more suitable for other plants.
Suggest how this process occurred. [2]

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(d) Give **two** reasons why the increase in the number and variety of flowering plants allowed the diversity of insects to increase. [2]

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(Total 7 marks)

7. Answer **one** of the following questions.

Either, *(a)* (i) Write an account of a single cardiac cycle and its control. [7]

(ii) Describe what is meant by the term 'double circulation'. State the advantages this might give an organism. [3]

Or *(b)* Discuss the advantages and disadvantages of chemical and biological control of insect pests. [10]

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Total 10 marks